EXPLANATORY STATEMENT

Issued by the Authority of the Parliamentary Secretary for Climate Change, Industry and Innovation

Carbon Credits (Carbon Farming Initiative) Act 2011

Carbon Credits (Carbon Farming Initiative) (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning—1.1) Methodology Determination 2013

Background

The *Carbon Credits (Carbon Farming Initiative) Act 2011* (the Act) enables the crediting of greenhouse gas abatement in the land sector. Greenhouse gas abatement is achieved by either reducing or avoiding emissions or by removing carbon from the atmosphere and storing it in soil or plants.

Abatement activities are undertaken as offsets projects. The process involved in establishing an offsets project is set out in Part 3 of the Act. An offsets project must be covered by, and undertaken in accordance with, a methodology determination.

Subsection 106(1) of the Act empowers the Minister to make, by legislative instrument, a methodology determination. The purpose of a methodology determination is to establish procedures for estimating abatement (emissions reductions and sequestration) and project rules for monitoring, record keeping and reporting on abatement.

A methodology determination must meet the offsets integrity standards set out in section 133 of the Act and the other requirements set out in section 106 of the Act. The Minister cannot make a methodology determination unless the Domestic Offsets Integrity Committee (DOIC) has endorsed the proposal for the methodology determination under section 112 of the Act and advised the Minister of the endorsement under section 113 of the Act. The DOIC is an independent expert panel established to evaluate proposals for methodology determinations.

Application of the Determination

The *Carbon Credits (Carbon Farming Initiative) (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning—1.1) Methodology Determination 2013* (the Determination) sets out the detailed rules for implementing and maintaining a 'savanna burning' project under the Carbon Farming Initiative. These kinds of projects aim to reduce methane (CH_4) and nitrous oxide (N_2O) released by fire into the atmosphere through the use of strategic early dry season fire management across savannas in the tropical north of Australia, in areas which receive more than 1,000 millimetres long-term average annual rainfall.

Project proponents wishing to implement the Determination must make an application to the Clean Energy Regulator (the Regulator) and meet the eligibility requirements for an offsets

project set out in subsection 27(4) of the Act. These requirements include compliance with the rules set out in the Determination.

Offsets projects that are undertaken in accordance with the Determination and approved by the Regulator can generate Australian carbon credit units (ACCUs) that can be sold to:

- Australian companies that pay the carbon price established under the *Clean Energy Act 2011*; and
- businesses in Australia wanting to offset their own carbon pollution.

Public consultation

The *Methodology for savanna burning* (the proposal) was developed by the former Department of Climate Change and Energy Efficiency (the Department) in collaboration with CSIRO, the North Australia Indigenous Land and Sea Management Alliance and Charles Darwin University.

The proposal was published on the Department's website from 25 May to 30 June 2011 for public comment. Stakeholders and members of the public who asked to be listed on the Carbon Farming Initiative mailing list maintained by the Department were notified of the public consultation period. Nine submissions were received including three classed as confidential that were not published on the Department's website.

The DOIC considered the issues raised in the public submissions during its assessment of the proposal as required under subsection 112(5) of the Act.

In March 2013 the DOIC considered a revised version of the proposal in which the burning efficiency values had been updated. The DOIC endorsed the revised proposal on 3 April 2013.

The North Australia Indigenous Land and Sea Management Alliance, the Indigenous Land Corporation, Darwin Centre for Bushfire Research, CSIRO, the National Inventory Systems and International Reporting Branch of the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education, and the Regulator were consulted in the development of the Determination.

Determination Details

The Determination is a legislative instrument within the meaning of the *Legislative Instruments Act 200*3.

The Determination commences retrospectively from 1 July 2010.

Retrospective commencement is authorised by subsection 122(3) of the Act, which provides that a determination can be expressed to have come into force on 1 July 2010 if the determination is made on or before 30 June 2013, and the application for endorsement was made on or before 30 June 2012. Both of these conditions are satisfied in this case.

Retrospective commencement does not adversely affect the rights of any person or impose a liability on any person in respect of anything done or not done before the date of registration on the Federal Register of Legislative Instruments. Rather, retrospective application confers a

benefit in that it allows persons to apply for and generate ACCUs in circumstances where they would not normally be eligible to apply.

Details of the Determination are at Attachment A.

A Statement of Compatibility prepared in accordance with the *Human Rights (Parliamentary Scrutiny) Act 2011* is at Attachment B.

Details of the Methodology Determination

Part 1 Preliminary

1.1 Name of Determination

Section 1.1 provides that the name of the Determination is the *Carbon Credits (Carbon Farming Initiative) (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning—1.1) Methodology Determination 2013*.

1.2. Commencement

Section 1.2 provides that the Determination commences retrospectively from 1 July 2010.

Retrospective commencement is authorised by subsection 122(3) of the Act.

While the Determination may apply to projects that were established prior to 1 July 2010, a project proponent can earn credits only for abatement which occurs from 1 July 2010. Subsections 27(15) and (16) of the Act prevent the crediting of abatement before this date.

1.3 Definitions

Section 1.3 defines a number of terms used in the Determination. These definitions include:

baseline period, which means the period of 10 years mentioned in subsection 4.20(1) or 4.20(2), whichever is applicable to the project. Section 4.20 sets out the rules for calculating average baseline emissions.

calendar year, which means the period 1 January to 31 December in a given year. Under the Act a project's declaration date cannot be earlier than 1 July 2010. Because the calculations and data collection in the Determination operate on a calendar year basis, projects to which the Determination applies should commence after the conclusion of a late dry season, which under the Determination ends on 31 December in a given year.

early dry season or ***EDS***, which means the months in a calendar year that are not the late dry season.

greenhouse gas assessment boundary, which means the boundary specified under section 4.3. Section 4.3 sets out the greenhouse gases that must be taken into account in relation to specified project activities.

late dry season or ***LDS***, which, in relation to a region, means the period in a calendar year determined in accordance with section 4.4. Section 4.4 sets out the rules for determining the start of the late dry season.

project commencement, which means the project's declaration date. This is the date on which the declaration of project eligibility under section 27 of the Act takes effect. The note to this defined term clarifies that because the Determination operates on a full calendar year basis, offsets projects under the Determination cannot have started before 31 December 2010.

Generally, where terms are not defined in the Determination, they have the meaning given by Section 5 of the Act.

Note References to sections, subsections, etc, in the Determination are intended to refer to the relevant section, subsection or other part of the Determination, unless otherwise specified.

1.4 Kind of project to which this Determination applies

The effect of paragraph 106(1)(a) of the Act is that a methodology determination must specify the kind of offsets project to which it applies.

Section 1.4 of the Determination lists the kinds of offsets projects to which the Determination applies. These kinds of project are specified offsets projects—that is, they are included in the list of specified kinds of project set out in regulation 3.28 of the *Carbon Credits (Carbon Farming Initiative) Regulations 2011* (the Regulations). These projects include the burning of savanna areas greater than 1 square kilometre during the early dry season. Burning of patches of savanna of less than 1 square kilometre in area is commonly undertaken as asset protection and is therefore not a specified kind of project.

Section 1.4 clarifies that the Determination applies to an agricultural emissions avoidance project which uses strategic early dry season fire management to reduce the emissions of CH_4 and N_2O from fires in areas of savanna in Australia that receive more than 1,000 millimetres long-term average annual rainfall.

Part 2 Requirements for declaration as eligible project

The effect of paragraph 106(1)(b) of the Act is that a methodology determination must set out requirements that must be met for a project to be declared an eligible offsets project. Under paragraph 27(4)(c) of the Act, the Regulator cannot declare that a project is an eligible offsets project unless satisfied that the project meets the requirements set out in the relevant determination.

2.1 Eligible projects

Part 2 of the Determination specifies the requirements that must be met before a project to which the Determination applies can be declared an eligible offsets project.

2.2 Location

Section 2.2 provides that the project area must be within Australia. This includes the external territories (such as Christmas Island and Norfolk Island).

2.3 Project land characteristics

Section 2.3 sets out the requirements for land in the project area on which project activities may occur and, as a consequence, project abatement estimated.

Paragraph (a) provides that the project area must include land that is located in an area that receives more than 1,000 millimetres long-term average annual rainfall. This can be determined by referring to the Savanna burning 1000 mm rainfall map, which can be found at www.climatechange.gov.au

Paragraph (b) specifies the vegetation classes that can exist on the land referred to in paragraph (a). The requirement in paragraph (b) may be demonstrated by providing to the Regulator, as part of the project description, documentary evidence such as a vegetation map generated from remotely-sensed imagery.

2.4 Project mechanism

Section 2.4 specifies that the abatement activity covered by the Determination involves the application of a regime that uses strategic early dry season fire management to reduce the risk and extent of late dry season wild fires. This activity shifts the seasonality of savanna burning from predominantly late dry season to predominantly early dry season, leading to a net reduction in fuel consumed and area burnt and a corresponding reduction in CH_4 and N_2O emissions released by fire.

Strategic early dry season fire management involves planning for, and implementing, prescribed burning practices that reduce fuel loads and create more-or-less continuously burnt fire breaks in the landscape in the early dry season. For example, in the early dry season fire breaks may be burnt alongside roads or fence line corridors, or onto relatively moist fuels along water courses, to help reduce the risk of wildfire spreading in the late dry season. At a landscape scale, an effective fire break system created in the early dry season consists of a network of inter-linking burnt patches and corridors. There are several ways to undertake strategic early dry season fire management, including igniting fires from aircraft, from vehicles along the sides of roads and tracks, from boats on waterways, or while walking

across country. The specific approaches used for undertaking strategic early dry season fire management including the location, timing and method, will depend on landscape features within the project areas and local weather conditions and are not prescribed in the Determination.

The specified abatement activity requires that:

- reductions in the area burnt;
- reduced emissions released from burnt areas; and
- the abatement generated as a result of the reduced emissions;

must be achieved by planned and intended deployment of prescribed early dry season burns. Natural and constructed barriers may be employed to stop the spread of fire. Active extinguishment of fires may also be used.

The note to section 2.4 refers to methods that cannot be used to reduce the fire scar area, as set out in section 3.2.

In some instances late dry season burning within the project area may be appropriate to reduce the overall extent of wildfire and the Determination does not explicitly disallow fire management in the late dry season. Strategic fire management in the late dry season that reduces the area of a project that is burnt each year may generate abatement. Project proponents cannot, however, reduce burning within the project by creating fire breaks around the outside of the project area.

2.5 Identification of project area

A project proponent is required to define the geographic boundaries of the project area when applying for declaration of an eligible offsets project. The information and documentary requirements to identify a project area at the time of application are specified in regulation 3.1 of the Regulations.

The project area includes land on which project activities are carried out.

Section 2.5 of the Determination provides that the boundaries of the project area must be delineated in accordance with the requirements for delineating the boundaries of a vegetation map. These requirements are set out in sections 3.3 and 3.4 of the Determination.

Part 3 Requirements for operation of eligible projects

Division 3.1 Operation of eligible projects

3.1 Operation of eligible projects

Section 3.1 specifies that the rules for operating a project to which the Determination applies are set out in Part 3.

3.2 Ineligible activities

Section 3.2 specifies that indirect methods for reducing the area burnt must not be used in the project area, such as the introduction of cattle. Cattle may be present in the project area, but the project area's historic stocking rates for the prevailing climatic and market conditions must not be exceeded.

Division 3.2 Vegetation maps

The Determination uses vegetation maps to identify the different vegetation types within a project. Differentiating vegetation types within a project is required because different vegetation types generate different levels of emissions when they are burnt.

3.3 Requirements for a vegetation map

Section 3.3 provides that a vegetation map of the project area must have a vegetation class assigned to each pixel. To develop this map, project proponents must assemble available mapping products for vegetation structure and other appropriate ancillary land attribute information (eg soil type, foliage cover) for the defined project area and, where not already available digitally, convert all mapping sources into digital form appropriate for GIS assessment. At least one of the inputs to the vegetation map must be cloud-free satellite imagery. The map must also be validated in accordance with section 3.4 within the 3 years immediately preceding project commencement.

The vegetation class assigned to each pixel of the map must be one of the four vegetation classes described in Table 1 of Schedule 1 to the Determination. These vegetation classes are:

- eucalypt open forest with tussock grass ground layer (EOF);
- eucalypt woodland, with tussock grass ground layer (EW);
- sandstone woodland with a mixed tussock and/or hummock (spinifex) grass ground layer (SW); and
- sandstone heath with a ground layer dominated by hummock grasses (spinifex) (SH).

3.4 Validation of a vegetation map

Section 3.4 sets out the requirements for validating a vegetation map.

The vegetation map must be validated to be at least 80% accurate overall at 1:100 000 scale to be acceptable for emissions accounting purposes.

Validation must be done using comprehensive ground-based and/or aerial-based stratified random sampling, based on information from independent waypoints. For projects over 10,000 square kilometres, at least 500 independent data waypoints must be used to refine the map, and a further 500 independent data waypoints must be used to assess separately the accuracy of the vegetation map. For projects with areas under 10,000 square kilometres, 250 independent data waypoints must be collected for each purpose.

Independent data waypoints must be of the order of 1 hectare in area to be congruent with the scale of the vegetation map. This data must be collected with reference to transects or a grid that samples all vegetation classes over the project area.

GIS software must then be used to validate the vegetation map. The independent data waypoints must be intersected with the vegetation map to derive a standard error matrix including errors of omission and commission. The data in the standard error matrix must be used to determine the accuracy of the map as a percentage.

This data should be used to improve the accuracy of the vegetation map.

Division 3.3 Fire maps

The Determination accommodates two different fire seasons, being an early dry season and a late dry season. Differentiating fire seasons is required because fires in the different fire seasons generate different levels of emissions.

The Determination uses fire maps to identify the extent of fires, or what is known as 'the fire scar area'. Fires within the fire scar area do not burn all the available fuel. A patchiness factor that estimates the proportion of fuel burnt is applied to determine the actual area of burnt fuel within a fire scar area. The fire scar area taking patchiness into account is called the 'area burnt'.

3.5 Monthly fire maps

Section 3.5 sets out the requirements for a monthly fire map.

Subsection (1) provides that monthly fire maps which are used to calculate the baseline emissions of a project area must have a spatial resolution of 1 square kilometre per pixel or finer.

Subsection (2) provides that monthly fire maps which are used to calculate project emissions for a project area must have a spatial resolution of 250 square kilometres per pixel or finer.

Subsection (3) provides that fire maps for the baseline period, fuel load estimation period and the project period must be from a consistent time series and be derived from a single satellite product.

The first note to the section recognises that the data required under section 3.5 can be represented on a single map.

The second note to the section recognises that the time series for the baseline period and the project period do not have to be consistent with each other.

The third note to the section recognises that satellite products can contain gaps due to factors such as cloud cover or sensor failure and that these gaps can be filled with products of lower resolution.

3.6 Seasonal fire maps

Section 3.6 sets out the requirements for seasonal fire maps.

The section provides for the development of an early dry season map and a late dry season map for each year of the baseline period and the reporting period.

Early dry season maps are developed by combining monthly fire maps for all months from January until the start of the late dry season into an early dry season map. Late dry season maps are developed by combining monthly fire maps from all months from the start of the late dry season until December into a late dry season map.

Seasonal fire maps used in relation to a baseline period or a reporting period must be of a consistent time series, be from a single satellite product, and be based on a time resolution of one month or less. The time series used to calculate the baseline period emissions, fuel loads and reporting period emissions do not, however, have to be consistent with each other.

3.7 Seasonal fire maps not sourced from NAFI

Section 3.7 clarifies that seasonal fire maps that are not based on maps sourced from NAFI and that are not used for the purposes of calculating the baseline period must be validated by a registered greenhouse and energy auditor to be 80% accurate overall for fire scars in the project area, at a 1:100 000 scale. The section also sets out the requirements for validation.

Seasonal fire maps based on maps sourced from NAFI do not need to be validated.

Part 4 The net abatement amount

Division 4.1 The net abatement amount

4.1 The net abatement amount

Under the Determination abatement is calculated by determining the annual emissions in the reporting period, and comparing them with average emissions during the baseline period. Annual emissions in both the baseline period and the reporting period are calculated using vegetation maps and fire maps.

Total emissions from fire in a project to which the determination applies are calculated by determining how many hectares of each vegetation type are burnt in each fire season and multiplying this area by several values that take the variation in emissions in each vegetation type and season into account.

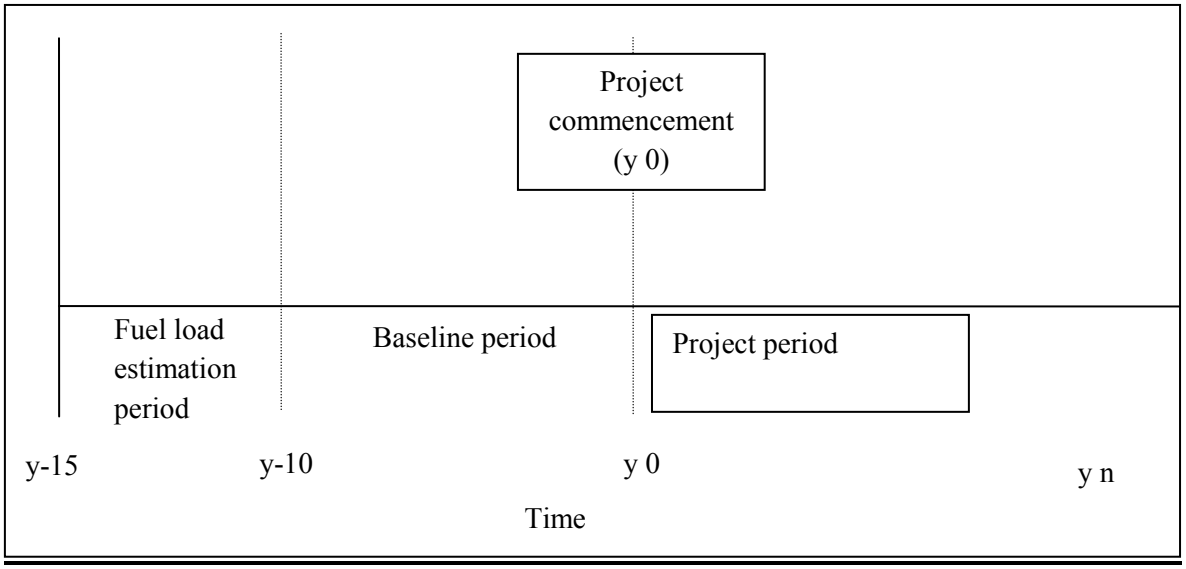
The baseline period is the 10 years preceding project commencement. The fuel load estimation period is the 5 years preceding the baseline period, and is also required to determine the fine fuel loads in the first 5 years in the baseline period. The different periods are shown below.

Defining phases of projects

For projects applying the Determination the following convention is applied to define various time periods:

- the fuel load estimation period is from between 1 and 5 years prior to year 10 of the baseline period;
- the baseline period is from zero to 10 years prior to the project commencing; and
- the project period is from project commencement (year zero) to project completion (year n).

This is represented graphically below.



Division 4.2 Calculations—Preliminary

4.2 General

Section 4.2 sets out the requirements for performing the calculations set out in Part 4 of the Determination.

Paragraph (a) clarifies that the calculations in Part 4 apply to a single calendar year. If the reporting period is longer than 1 calendar year, the calculations in Part 4 must be performed for each calendar year and then summed to obtain total abatement for the project area within the reporting period for whole calendar years.

The start of the late dry season will vary across the north of Australia with the timing of the wet season. A single late dry season start date across the country will not accurately capture this variation. This issue is addressed by splitting the area to which the Determination applies into a number of regions and calculating the start of the late dry season separately for each region. If a project area occurs across more than one region the calculations in Part 4 must be performed for each region and then summed to obtain a total abatement amount for the project area in each year of the baseline period and the reporting period.

The extent of the different defined regions and their respective start dates is published at www.climatechange.gov.au each year in accordance with section 4.4.

Subparagraph (d)(i) provides that project proponents must use a vegetation map when carrying out calculations under the Determination.

Subparagraph (d)(ii) provides that project proponents must also use monthly fire maps created for each month of each year of the fuel load estimation period, the baseline period and the reporting period.

Paragraph (e) specifies that data used in calculations must comply with the data collection requirements set out in Division 4.4.

The effect of paragraph (f) is that the results of calculations must be kept in tables collected in forms prescribed in Schedule 2 to the Determination. Form 1 contains tables recording all calculations which must be retained by project proponents. Form 2 contains tables recording calculations which must be included in an offsets report. These forms are intended to assist project proponents in recording the results of the manipulation of spatial data and undertaking the calculations required by the Determination.

Some of the calculations must use a factor or parameter which is specified in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (the NGER Measurement Determination), and the *National Greenhouse and Energy Reporting Regulations 2008* (the NGER Regulations). The purpose of paragraph (g) is to clarify that if the NGER Regulations or NGER Measurement Determination are amended during an offsets reporting period, the calculations carried out under Part 4 must use the factor or parameter prescribed in the NGER Regulations or NGER Measurement Determination in force at the time the report is either required to be submitted or actually submitted, whichever occurs first.

4.3 Greenhouse gas assessment boundary

Section 4.3 describes the emission sources that need to be assessed in order to determine the total net change in greenhouse gas emissions resulting from a project abatement activity.

The emission sources which need to be taken into account when calculating abatement are:

- burning of flammable living and dead vegetation (fine, coarse and heavy fuels and shrubs) in the project area during the baseline period and project activity period; and
- fuel used to establish and maintain the project, for example for helicopters and other motor driven equipment or drip torches.

In general, CH_4, N_2O and CO_2 emissions are included in the greenhouse gas assessment boundary.

A number of emission sources are excluded from the abatement calculations.

CO_2 emissions from burning are excluded because the CO_2 emitted is taken to be recaptured in vegetation during the next growing cycle.

Above and below ground biomass (living matter that either survives the fire or regrows) and soil carbon are also excluded. Because the use of fire management to reduce the spatial extent of late dry season fires has been shown to increase carbon sequestration in the landscape, the exclusion of these carbon pools from the greenhouse gas assessment boundary is conservative.

Emissions from microbial pathways are also excluded. A reduction in the frequency and spatial extent of late dry season fires results in more biomass being decomposed via microbial pathways, instead of being burnt by fire. Directing more biomass through the microbial decomposition pathway is likely to generate some emissions, for example from termite activity. CH_4 emissions from termite activity are excluded on the basis that quantification of these emissions is highly uncertain. N_2O emissions from termite mounds and microbial pathways are excluded on the basis that they are unaffected by changes in fire regimes.

4.4 The start and end of the late dry season

The start of the late dry season varies across the north of Australia.

To take this variability into account the Regulator may categorise the eligible land area that applies under the Determination into a number of different regions.

Subsection 4.4(1) provides that each year the start date of the late dry season for each region may be determined and that the date, and the method used to determine it, made available.

This information will be accessible at www.climatechange.gov.au

Subsection 4.4(2) provides that if the start date of the late dry season for a region is determined in accordance with subsection 4.4(1), the start date will be 1 July, 1 August, or 1 September.

The effect of subsection 4.4(2) is that the late dry season cannot start any earlier than 1 July or any later than 1 September. For example, if in a particular year the late dry season was

calculated to start *before* 1 July, 1 July would still be taken to be the start of the late dry season. Similarly, if the method were to determine that the late dry season started *after* 1 September, 1 September would still be taken to be the start of the late dry season.

In some cases the data required to calculate the start of the late dry season may not be available and therefore no applicable start date may be calculated or published. In such cases subsection 4.4(3) provides that the default start date for the late dry season is 1 August, which is the date used in Australia's National Greenhouse Accounts.

Subsection 4.4(4) provides that the applicable start of the late dry season for the project area must be recorded in Table 9.

Subsection 4.4(5) specifies the date on which the late dry season is taken to end.

Division 4.3 Calculations

Division 4.3 specifies how to calculate annual emissions. This process must be used to calculate annual emissions in both the baseline period and the project period.

The process for calculating annual emissions is represented below in Equations A and B. The Determination provides a step-by-step process for performing these calculations. This process is set out in the Determination in Equations 1–6 and 8–9, and involves the use of maps, Geographic Information System (GIS) software and spreadsheets.

For CH_4:

$E_{CH_4} = M_{CH_4} \sum_{pk} \left(A_{pk} P_k \sum_{l} \left(EF_{pl} FL_{npl} CC_l \sum_{m} \left(S_m BEF_{klm} \right) \right) \right)$	**Equation A**

For N_2O:

$E_{N_2O} = M_{N_2O} \sum_{pk} \left(A_{pk} P_k \sum_{l} \left(EF_{pl} FL_{npl} CC_l NC_l \sum_{m} \left(S_m BEF_{klm} \right) \right) \right)$	**Equation B**

Where the subscript:

p denotes the vegetation class;

k denotes the fire season;

l denotes the fuel size class;

m denotes the fire severity class; and

n denotes the number of years since the patch of land was last burned.

The parameters are:

E_{CH_4} = emissions (Gg) of CH_4;

E_{N_2O} = emissions (Gg) of N_2O;

M = ratio of molecular mass (kg/mol) to the elemental mass;

A = fire scar area (ha);

P = patchiness;

EF = emission factor (% of fuel elemental content released in fire);

FL= fuel load (t dry matter ha^{-1});

CC = carbon content of fuel (grams of carbon per gram of dry fuel);

NC = elemental nitrogen to carbon ratio;

S = severity class (fraction of fires of severity class m in fire season k); and

BEF = burning efficiency.

Calculating annual emissions in the baseline period and the reporting period involves four steps. Each step requires the use of a spreadsheet, a GIS, or both. The steps are:

1. develop maps and calculate the fire scar area (GIS);
2. calculate annual fire emissions for the baseline and the project period (spreadsheet, GIS);
3. calculate the total annual project emissions (spreadsheet); and
4. calculate net annual greenhouse gas abatement (spreadsheet).

Each of these steps is the focus of a subdivision within Division 4.3 in the Determination.

Subdivision 4.3.1 Developing maps and calculating the fire scar area

4.5 Developing maps used to calculate emissions

Section 4.5 describes the vegetation maps and fire maps that are required to underpin calculations to determine the fire scar area for a project.

The detailed requirements for these mapping products are described in Part 3.

The required maps are:

- a vegetation map of the project area;
- monthly fire maps of the project area for each month of the calendar year for each year of the baseline period, the fuel load estimation period and the reporting period; and
- seasonal fire maps of the project area for the early and late dry seasons in each year of the baseline period and the reporting period, which must be developed from the monthly fire maps.

Using the vegetation map, the area of each vegetation class must be calculated in numbers of pixels for each vegetation class.

Monthly fire maps can be sourced from satellite products, for example the Moderate Resolution Imaging Spectroradiometer (MODIS) for calculating project emissions and the Advanced Very High Resolution Radiometer (AVHRR) for calculating baseline emissions. These fire maps can be sourced from the North Australian Fire Information Service (NAFI), available at www.firenorth.org.au/nafi

Seasonal fire maps must be developed in accordance with section 3.6 and, if not sourced from NAFI, validated in accordance with section 3.7.

4.6 Calculating the fire scar area (A) in the early dry season and the late dry season periods for each vegetation class

Section 4.6 specifies how to calculate the fire scar area in hectares. The fire scar area is the area of a project that is burnt without taking patchiness into account.

The fire scar area in hectares must be calculated for each year in the baseline period and for each year in the reporting period. This area must be calculated for each vegetation class and fire season.

The fire scar area must be calculated using GIS software and is achieved by overlaying the vegetation map for the project area with the seasonal fire maps. This process produces a raster map that allocates a vegetation class and a fire season value to each burnt pixel. Project proponents must convert the number of burnt pixels in the raster map into hectares using GIS software. The results must be recorded in Table 10 of Form 1 of Schedule 2 to the Determination.

Subdivision 4.3.2 Calculating annual fire emissions for the baseline period and the reporting period

Subdivision 4.3.2 outlines the equations required to calculate the annual emissions of greenhouse gases in a single calendar year. These calculations must be made for each year of the baseline period and each year of the reporting period.

4.7 Calculating annual fire emissions

In calculating emissions released by fire, the Determination only applies to CH_4 and N_2O fire emissions. The CO_2 released by the fire is taken to be reabsorbed by the landscape in the next growing season.

The annual emissions of greenhouse gases for the project area for each calendar year of the baseline period and the reporting period must be calculated by multiplying the area burnt by the potential emissions using Equation 1.

Sections 4.8 to 4.18 describe the data and calculations required prior to evaluating Equation 1.

Section 4.19 describes the process for making the calculation described in Equation 1.

4.8 Calculating the area burnt (Ab)

The area burnt is the fire scar area (described in section 4.6) taking patchiness into account. The area burnt is calculated by multiplying the fire scar area by a fraction that takes the patchiness of fires into account as shown in Equation 2.

Patchiness is the fraction of a fire scar area that is actually burnt in a fire. Patchiness varies for each fire season. For the early dry season patchiness is taken to be 0.107, and for the late dry season patchiness is taken to be 0.889. The result of the calculation of Equation 2 must be recorded in Table 11 of both Form 1 and Form 2 of Schedule 2 to the Determination.

4.9 Calculating potential emissions (Pe)

'Potential emissions' are a calculation of the quantity of emissions that would be released as a result of a fire on 1 hectare of a project for each greenhouse gas, and each vegetation class in each fire season.

Potential emissions must be calculated for each greenhouse gas according to each vegetation class and fire season because these variables have an effect on the emissions from fire. For example, a 1-hectare fire in an area of eucalypt open woodland in the early dry season releases different levels of emissions from a 1-hectare fire in an area of sandstone heath in the late dry season.

Equation 3 must be used to calculate the potential emissions of CH_4 and Equation 4 must be used to calculate potential emissions of N_2O. The results of these calculations must be recorded in Tables 17 to 20 and aggregated by fire season and vegetation class in Table 21 of Form 1 of Schedule 2 to the Determination.

The note shows how the calculations in Equations 3 and 4 are performed using the tables in which the results of preceding calculations and certain fixed parameters (constants) are recorded.

4.10 Burning efficiency (BEF)

The burning efficiency is the mass of combusted fuel that is volatilised in a fire. The burning efficiency varies with fire severity, fuel size class and fire season. The values for burning efficiency for each fuel size class and fire season, taking fire severity into account, are presented in Table 1 of the Determination.

4.11 Fuel load (FL)

The fuel load is the amount of fuel in tonnes per hectare for each fuel size class and each vegetation class. Calculating the potential emissions for CH_4 and N_2O requires a calculation of the fuel load present in the project area.

The four fuel size classes used in the Determination are:

- fine fuel: defined as grass, leaf litter, bark and small twigs less than 6 millimetres in diameter;
- coarse: defined as twigs and dead branches greater than or equal to 6 millimetres and less than or equal to 50 millimetres diameter;
- heavy: branches and logs of greater than 50 millimetres in diameter; and
- shrubs: defined as living plants with a stem diameter of less than 50 millimetres at a height of 1.3 metres.

The fuel loads for coarse, heavy and shrub fuel size classes are given in Table 2 of subsection 4.11(1). The fuel load for fine fuels varies depending on the recent fire history in a project area and must be calculated using project specific fire maps.

To calculate fine fuel loads, project proponents must assess the fire history of the project area in the 5 years prior to the year being analysed (the analysis year). This assessment must be done for every year in both the baseline and the reporting period. For example, to calculate the fine fuel load for the first year in a reporting period, project proponents must undertake analysis of the fire history in the last 5 years of the baseline period. This means that, to determine the average emissions in the 10 year baseline period, analysis of fire patterns must be undertaken for at least 15 years preceding project commencement.

Sections 4.12, 4.13 and 4.14 describe the process for calculating fine fuel loads.

4.12 Calculating years since last burnt (YSLB) for a pixel

Fuel loads for fine fuels vary depending on the time since a piece of land was last burnt, which is known as the years since last burnt (YSLB). For example, if an area of land was exposed to fire 1 year ago, the fine fuel load will be lower than a comparable area of land that was exposed to fire 5 years ago.

Section 4.12 requires the project proponent to calculate the YSLB for each year in the baseline period and the reporting period. This must be done using GIS software.

The process for determining the years since last burnt for a single year requires analysis of the fire history in the 5 years prior to the analysis year. This process therefore requires the analysis of fire maps for 6 years, being for the analysis year and the 5 previous years.

The steps involved in calculating YSLB are:

1. aggregate the monthly fire maps into 6 annual (calendar year) fire maps showing each pixel as burnt or unburnt (paragraph 4(a)) for the 6 years used in the analysis;
2. assign the year that the maps relate to as a value to all burnt pixels in each fire year and assign a zero value to all unburnt pixels and attach a name to each map using the convention specified in paragraphs 4(b), (c) and (d);
3. undertake a standard grid operation in GIS software that takes the values from one map (in this case Gy) and subtracts the values in another map (in this case years Gy-1

to Gy-5) producing 5 maps (Dy-1 to Dy-5) that show the difference in values between the analysis year and each of the other 5 years (paragraphs 4(e) and (f));

4. calculate the minimum value allocated to each corresponding pixel in each map and collate the results in a single map by performing a standard grid operation in GIS software that identifies the lowest value allocated to each corresponding pixel in each of the 5 maps (Dy-1 to Dy-5) and converts the values into a single map (paragraph 4(g)); and
5. reclassify the values in the map to produce a single map with pixel values that show the years since last burnt in accordance with paragraphs 4(h) and (i).

Steps 1 to 5 will need to be repeated for each year in the baseline period and each year in the reporting period and must use the 5 years preceding each analysis year. This process is applied slightly differently in the calculations for the baseline period and the project period.

To calculate annual emissions in the baseline period the fine fuel loads must be calculated for the first 5 years of the baseline (the years which are 6 to 10 years prior to the project commencement year) by analysing the years in the fuel load estimation period to make up the required 5 years of fire history.

4.13 Calculating the relative frequency distribution of fire history

A frequency distribution of fire history must be calculated by overlaying the YSLB map determined in accordance with section 4.12 with the vegetation map to determine the number of pixels burnt in each vegetation class for each value of YSLB. The result must be recorded in Table 14 of Form 1 of Schedule 2 to the Determination.

A frequency distribution of each value of YSLB for each vegetation class must be produced and the results presented in Table 15 of Form 1 of Schedule 2 to the Determination.

4.14 Calculating the fuel load for fine fuels

The fine fuel load values must be calculated for each value of YSLB and vegetation class by multiplying the frequency distribution of values of YSLB shown in Table 15 with the fuel accumulation values shown in Table 3 of section 4.14, for each vegetation class. The results must be recorded in Table 16 of Form 1 of Schedule 2 to the Determination.

The total fine fuel load values for each vegetation class must be obtained by totalling the value of each row of Table 16 and recorded in Table 13 of Form 1 of Schedule 2 to the Determination.

4.15 Emission factors (EF)

Section 4.15 sets out the emission factors for CH_4 for each combination of vegetation class and fuel size class for use in Equation 3 and the emission factors for N_2O for each combination of vegetation class and fuel size class for use in Equation 4.

4.16 Carbon content (CC)

Section 4.16 sets out the carbon content for each vegetation class and fuel size class for use in Equations 3 and 4.

4.17 Nitrogen to carbon ratio (NC)

Section 4.17 sets out the nitrogen to carbon ratio for each fuel class size for use in Equation 4.

4.18 Converting the molecular mass to elemental mass (M)

Section 4.18 sets out the conversion factors to convert the value of emissions of CH_4 and N_2O from the molecular mass to the elemental mass for use in Equations 3 and 4.

4.19 Calculating the annual fire emissions in tonnes CO_2-e

Subsection 4.19(1) provides that the total annual emissions of each greenhouse gas in each fire season for each vegetation class must be calculated and the results recorded in Table 22 of both Form 1 and Form 2 of Schedule 2 to the Determination.

Subsection (2) explains how the calculation in subsection (1) is to be made.

Subsections (3) and (4) provide that the carbon dioxide equivalent (CO_2-e) of the total annual emissions must be calculated by multiplying the emissions amount for each greenhouse gas by the Global Warming Potential specified in regulation 2.02 of the NGER Regulations.The results of this calculation must be recorded in Table 23 of Form 1 of Schedule 2 to the Determination.

Subsections (5) and (6) provide that the results for each gas must be combined to determine the total annual emissions of greenhouse gas in tonnes of CO_2-e, and the total recorded in Table 25 of both Form 1 and Form 2 of Schedule 2 to the Determination.

4.20 Calculating average baseline emissions

Section 4.20 specifies the process for calculating the project baseline, as required under paragraph 106(4)(f) of the Act.

A project's baseline will be the estimated average annual CH_4 and N_2O emissions from the project area in the 10 years immediately preceding commencement of the project. Where early dry season fire management has been implemented within the project area for a period of at least 1 year but no more than 6 years immediately prior to commencement of the project, the baseline emissions can be estimated as the 10 years preceding this period of fire management.

The average baseline emissions will be calculated by determining the average annual emissions in the baseline period. The process for calculating annual emissions is described in section 4.7.

The baseline period of 10 years is based on typical fire return intervals for relevant sites in the savannas. A 10 year baseline period will cover several fire cycles and provide a reliable baseline for estimating the emissions from project areas when fire is unmanaged or managed under a different management regime than that prescribed by this method.

The annual emissions in tonnes of CO_2-e each year of the project baseline and the average baseline emissions must be recorded in Table 24 of both Form 1 and Form 2 of Schedule 2 to the Determination.

Subdivision 4.3.3 Calculating total annual project emissions

4.21 Calculating the emissions from fuel used to establish and manage a project

The total emissions of greenhouse gases from fuel used to establish and manage an offsets project must be calculated for each fuel type and each greenhouse gas using Equation 6. This includes fuel used in transportation to manage fire in the early dry season and collect data in the field, and fuel used in drip torches to light fires.

The total emissions of greenhouse gases from fuel used to establish and manage an offsets project must be calculated using Equation 7 and recorded in Table 26 of Form 1 of Schedule 2 to the Determination.

Greenhouse gas emissions from fuel use must be estimated using the energy content factors and emission factors specified in Schedule 1 to the NGER Measurement Determination in force at the time the offsets report is submitted or is required to be submitted, whichever occurs first.

4.22 Calculating total project emissions

Section 4.22 provides that the total annual CO_2-e emissions for an offsets project must be calculated using Equation 8 to be the sum of annual fire emissions (calculated under section 4.7) and emissions from fuel use (calculated under section 4.21). The results must be recorded in Table 27 of Form 1 of Schedule 2 to the Determination.

Subdivision 4.3.4 Calculating net annual greenhouse gas abatement

4.23 Calculating net annual greenhouse gas abatement

Paragraph 106(1)(c) of the Act provides that a methodology determination must specify a method for calculating the CO_2-e net abatement amount for the project in relation to a reporting period.

Section 4.23 of the Determination specifies that the CO_2-e net abatement amount must be calculated by subtracting total project emissions from average baseline emissions using Equation 9.

The results of this calculation must be recorded in Table 28 of both Form 1 and Form 2 of Schedule 2 to the Determination.

Division 4.4 Data collection

4.24 Data collection

The effect of paragraph 106(3)(c) of the Act is that a methodology determination may require the project proponent of an eligible offsets project to comply with specified record-keeping requirements relating to the project. A project proponent who fails to comply with a record-keeping requirement relating to the project will have contravened a civil penalty provision (section 193 of the Act).

Subsection 4.24(1) of the Determination provides that appropriate data must be collected in order to develop and validate the vegetation maps and fire maps in the manner specified in Divisions 3.2 and 3.3.

Subsections 4.24(2) and (3) require the collection of data regarding the quantity of fuel used to establish and maintain the project for each reporting period. This is to allow emissions from fuel use for the project to be calculated.

Part 5 Record-keeping and reporting requirements

Division 5.1 General

5.1 Application

The effect of subsection 106(3) of the Act is that a methodology determination may require the project proponent of an eligible offsets project to comply with specified record-keeping and reporting requirements.

Under Parts 17 and 21 of the Act, a failure to comply with these requirements may constitute a breach of a civil penalty provision, and a financial penalty may be payable.

The record-keeping and reporting requirements specified in Part 5 of the Determination are in addition to any requirements specified in the Regulations.

Division 5.2 Record-keeping requirements

5.2 Records that must be kept

Section 5.2 specifies the records that must be kept in relation to the project.

Division 5.3 Offsets report requirements

The Determination requires project proponents to submit:

- a report for the first reporting period; and
- ongoing reports for subsequent reporting periods.

Sections 5.3 and 5.4 set out the information that must be included in the first and subsequent offsets reports that a project proponent is required to submit.

Schedule 1

Schedule 1 lists vegetation classes that are eligible under the Determination—see section 2.3.

Schedule 2

Schedule 2 sets out the forms for recording the results of calculations set out in Part 4.

Statement of Compatibility with Human Rights

Prepared in accordance with Part 3 of the *Human Rights (Parliamentary Scrutiny) Act 2011*

Carbon Credits (Carbon Farming Initiative) (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning—1.1) Methodology Determination 2013

This legislative instrument is compatible with the human rights and freedoms recognised or declared in the international instruments listed in section 3 of the *Human Rights (Parliamentary Scrutiny) Act 2011*.

Overview of the Legislative Instrument

The *Carbon Credits (Carbon Farming Initiative) (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning—1.1) Methodology Determination 2013* (the Determination) sets out the detailed rules for implementing and monitoring projects under the Carbon Farming Initiative to reduce methane (CH_4) and nitrous oxide (N_2O) emissions from fire across savannas in the fire prone tropical north of Australia.

The Determination involves the application of an early dry season (EDS) burning regime to reduce the risk and extent of late dry season (LDS) fires. This will shift the seasonality of burning from predominantly LDS to predominantly EDS fires, leading to a net reduction in fuel consumed and area burnt with a corresponding reduction in CH_4 and N_2O emissions.

Project proponents wishing to implement the Determination must make an application to the Clean Energy Regulator (Regulator) and meet the eligibility requirements set out under the *Carbon Credits (Carbon Farming Initiative) Act 2011*. Offsets projects that are approved by the Regulator can generate Australian carbon credit units that can be sold to:

- Australian companies that pay the carbon price established under the *Clean Energy Act 2011*; and
- businesses in Australia wanting to offset their own carbon pollution.

Human rights implications

This legislative instrument does not engage any of the applicable rights or freedoms.

Conclusion

This legislative instrument is compatible with human rights as it does not raise any human rights issues.

Yvette D'Ath, Parliamentary Secretary for Climate Change, Industry and Innovation